



Docket: 33810/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | | | |
|-------------|-----------------------------|---------------------------------|--------------------|
| First Named | | | |
| Inventor: | Ni Zugen | | |
| Appln. No.: | 10/726,061 | | |
| Filed: | December 2, 2003 | | |
| Title: | Silencer for Vacuum Cleaner | Examiner: Group Art Unit: | Unknown Unknown |

**LETTER SUBMITTING CERTIFIED COPY
PURSUANT TO 35 U.S.C. §119**

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

I hereby certify that this document is being sent via First Class U. S. mail
addressed to: Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-
1450, on this 15 day of December, 2003.

Frances Egan
(Signature)

Dear Sir:

Pursuant to 35 U.S.C. §119, to perfect the claim for foreign priority benefits in the above-
identified patent application, enclosed for filing is a certified copy of the original Chinese
Application No. 03 1 52868.6, filed on August 26, 2003, including specification and drawings
and certificate.

Respectfully submitted,

**DORSEY & WHITNEY LLP
Customer Number 25763**

Date: Dec. 15, 2003

By: Min S. Xu
Min (Amy) S. Xu (Reg. No. 39,536)
Intellectual Property Department
Suite 1500, 50 South Sixth Street
Minneapolis, MN 55402-1498
(612) 752-7367

证 明

本证明之附件是向本局提交的下列专利申请副本

申 请 日： 2003 08 26

申 请 号： 03 1 52868.6

申 请 类 别： 发明

发明创造名称： 吸尘器消音装置

申 请 人： 苏州金莱克清洁器具有限公司

发明人或设计人： 倪祖根

中华人民共和国
国家知识产权局局长

王素川

2003 年 10 月 29 日

权 利 要 求 书

1. 一种吸尘器用消音装置，其特征在于：该装置包括有一个以上安装在出风通道上的、密闭的扩张室(1)，扩张室(1)的两端设有分别与出风通道连接的进风口(2)和出风口(3)，扩张室(1)于垂直气流方向的截面分别大于进风口(2)和出风口(3)的截面积。
2. 根据权利要求 1 所述的吸尘器用消音装置，其特征在于：所述扩张室(1)内设有分隔进风口(2)和出风口(3)的消音隔板(4)，消音隔板(4)上布有小孔(5)。
3. 根据权利要求 1 或 2 所述的吸尘器用消音装置，其特征在于：所述扩张室(1)由两半对接组成，消音隔板(4)固定在对接位置上。
4. 根据权利要求 1 或 2 所述的吸尘器用消音装置，其特征在于：所述扩张室(1)的两内端面至消音隔板(4)的距离分别大于 10 毫米而小于 100 毫米。
5. 根据权利要求 1 所述的吸尘器用消音装置，其特征在于：所述扩张室(1)的垂直气流方向的截面积大于出风口(2)截面积的两倍。
6. 根据权利要求 1 所述的吸尘器用消音装置，其特征在于：所述扩张室(1)的内壁设有吸音材料(6)。
7. 根据权利要求 1 所述的吸尘器用消音装置，其特征在于：所述进风口(2)和出风口(3)的周边钻有小孔(7)。
8. 根据权利要求 1 所述的吸尘器用消音装置，其特征在于：所述进风口(2)和出风口(3)的截面积分别小于 5000 平方毫米。
9. 根据权利要求 6 所述的吸尘器用消音装置，其特征在于：所述扩张室(1)内壁的吸音材料厚度大于 2 毫米。

说 明 书

吸尘器消音装置

技术领域

本发明涉及一种吸尘器消音装置。

背景技术

传统的吸尘器的出风消音是通过增加风道曲折性，也就是迷宫式的风道，使得声波在传播过程中的能量损失以及通过风道转弯处安置多孔吸声材料来吸收声能，从而达到降噪的目的，这种结构的主要缺点是消音降噪效果比较差。

发明内容

本发明的目的是：提供一种吸尘器用消音装置，该装置将多种消音结构集中于一体，安装在吸尘器的排风口上，可以大大降低吸尘器在使用时发出的噪音。

本发明的技术方案是：一种吸尘器用消音装置，该装置包括有一个以上安装在出风通道上的、密闭的扩张室，扩张室的两端分别设有与出风通道连接的进风口和出风口，扩张室于垂直气流方向的截面分别大于进风口和出风口的截面积。

本实用新型进一步的技术方案是：一种吸尘器用消音装置，该装置包括有一个以上安装在出风通道上的、密闭的扩张室，扩张室的两端设有分别与出风通道连接的进风口和出风口，扩张室于垂直气流方向的截面分别大于进风口和出风口的截面积；所述扩张室内设有分隔进风口和出风口的消音隔板，消音隔板上布有小孔；所述扩张室由两半对接组成，消音隔板固定在对接位置上。

本实用新型更详细的技术方案是：一种吸尘器用消音装置，该装置包括有一个以上安装在出风通道上的、密闭的扩张室，扩张室的两端设有分别与出风通道连接的进风口和出风口，扩张室于垂直气流方向的截面分别大于进风口和出风口的截面积；所述扩张室内设有分隔进风口和出风口的消音隔板，消音隔板上布有小孔；所述扩张室由两半对接组成，消音隔板固定在对接位置上；所述扩张室的两内端面至消音隔板的距离分别大于 10 毫米而小于 100 毫米；所述扩张室的垂直气流方向的截面积大于出风口截

面积的两倍；所述扩张室的内壁设有吸音材料，吸音材料厚度大于 2 毫米；所述进风口和出风口的周边钻有小孔；所述进风口和出风口的截面积分别小于 5000 平方毫米。

本发明的优点是：

1. 本实用新型集多种消音结构于一体，通过多种消音结构来降低吸尘器使用时产生的噪声，大大提高了消音降噪的效果。

2. 本实用新型还可以用多个装置串联起来使用，串联后的消音装置的消音降噪效果会更好。

3. 本实用新型的扩张室可以单独连接在吸尘器的出风通道上，也可以在扩张室内安装消音隔板，安装有消音隔板的扩张室降噪效果会更好。

附图说明

下面结合实施例对本发明作进一步的描述：

图 1 为本实用新型的剖面结构示意图；

其中：1 扩张室；2 进风口；3 出风口；4 消音隔板；5 小孔；6 吸音材料；7 小孔。

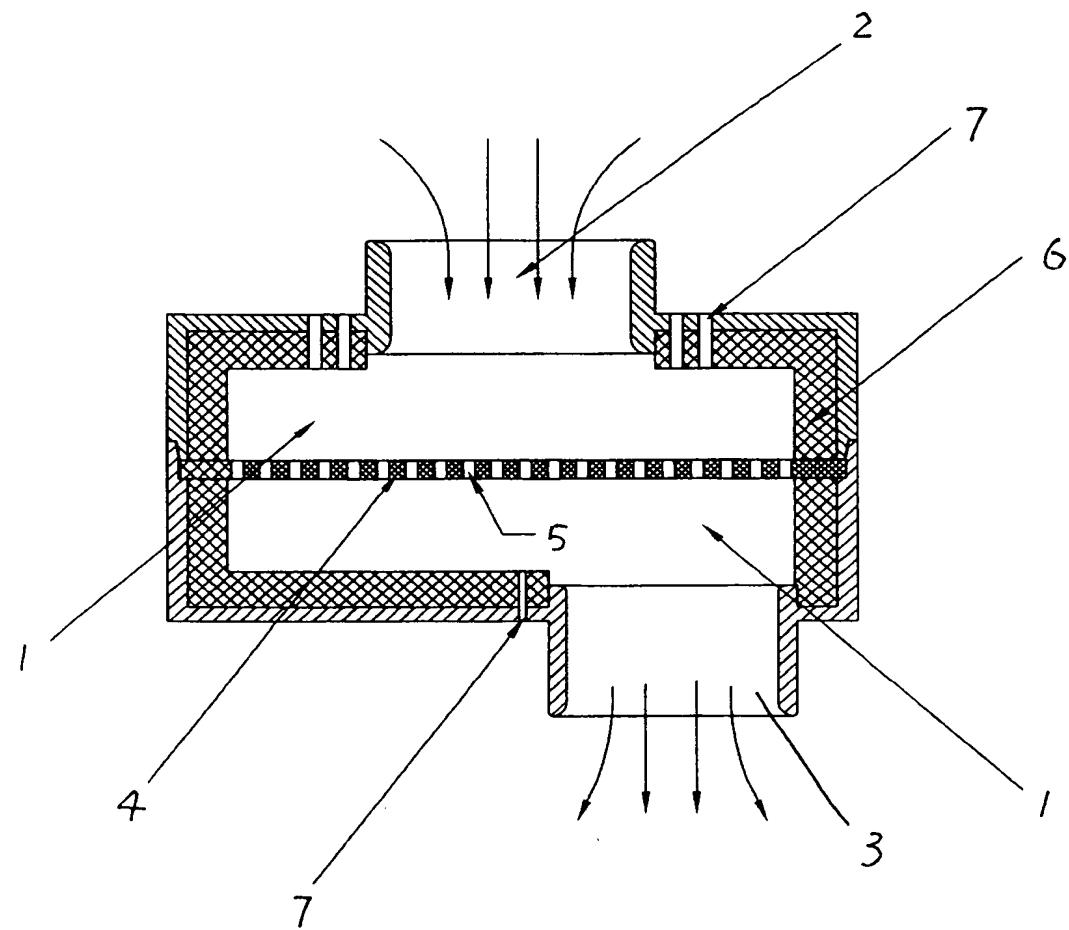
具体实施方式

实施例：如图 1 所示，一种吸尘器用消音装置，该装置包括有一个以上安装在出风通道上的、密闭的扩张室(1)，扩张室(1)的两端设有分别与出风通道连接的进风口(2)和出风口(3)，扩张室(1)于垂直气流方向的截面分别大于进风口(2)和出风口(3)的截面积，扩张室(1)内设有分隔进风口(2)和出风口(3)的消音隔板(4)，消音隔板(4)上布有小孔(5)，扩张室(1)可以由两半对接组成，消音隔板(4)固定在对接位置上，扩张室(1)的两内端面至消音隔板(4)的距离分别大于 10 毫米而小于 100 毫米，扩张室(1)的垂直气流方向的截面积大于出风口(2)截面积的两倍，扩张室(1)的内壁设有吸音材料(6)，吸音材料厚度大于 2 毫米，进风口(2)和出风口(3)的周边钻有小孔(7)，进风口(2)和出风口(3)的截面积分别小于 5000 平方毫米。

使用时，吸尘器的电机排出来的风首先经过进风口(2)进入扩张室(1)的前部，由于截面积的瞬间扩大，从而达到了降低噪音的效果，同时扩张室(1)的四壁的吸音材料(6)又吸收了一部分声能，起到一定的消音效果，然后风和声波通过中间密布小孔(5)的消音隔板(4)，使得声能进一步损失，达到消

音效果，接着又进入扩张室(1)的后部，进一步降低噪音，如果在空间允许的条件下，可以再串联几个扩张室(1)，这样的消音降噪效果会更好，本实用新型的扩张室(1)可以单独连接在吸尘器的出风通道上，也可以在扩张室(1)内安装消音隔板(4)，安装有消音隔板(4)的扩张室(1)降噪效果会更好。

说 明 书 附 图



卷之三

CERTIFICATE

The annex to this certificate is a copy of the application filed with the present office:

Application Date: 2003 08 26

Application Number: 03 1 52868.6

Application Type: Invention

Title of Invention: Silencer for Vacuum Cleaner

Applicant: NI, Zugen

Inventor or Designer: NI, Zugen

Commissioner of
the State Intellectual Property Office
of the People's Republic of China

WANG Jingchuan

29 October 2003

Silencer for Vacuum Cleaner

Field of the Invention

The present invention relates to a silencer for a vacuum cleaner.

Background of the Invention

In conventional exhaust silencers for vacuum cleaners, the noise is reduced by means of increasing the tortuosity of the airflow channel, i.e., by using labyrinthic airflow channels, to dissipate sound energy and by means of disposing porous sound-absorbing materials at the turning corners of the airflow channel to absorb sound energy. Poor noise silencing effect, however, is the main disadvantage of the above-mentioned silencing structures.

Summary of the Invention

The object of the invention is to provide a silencer for a vacuum cleaner which incorporates several different silencing structures. The silencer can be mounted in the exhaust channel of the vacuum cleaner to considerably reduce the noise generated by a vacuum cleaner in operation.

In one aspect of the invention, a silencer for a vacuum cleaner comprises at least one hermetic expansion chamber mounted in an exhaust channel of the vacuum cleaner. The expansion chamber at its two sides has an inlet and an outlet connected to the exhaust channel. The cross-sectional area of the expansion chamber in the direction perpendicular to the airflow is larger than that of each of the inlet and the outlet.

In a further aspect of the invention, a silencer for a vacuum cleaner comprises at least one hermetic expansion chamber mounted in an exhaust channel of the vacuum cleaner. The expansion chamber at its two sides has an inlet and an outlet connected to the exhaust channel. The cross-sectional area of the expansion chamber in the direction perpendicular to the airflow is larger than that of each of the inlet and the outlet. A silencing board is mounted in the expansion chamber, separating the inlet from the outlet, with a plurality of pores distributed throughout in the silencing board. The expansion chamber is formed by two halves that are oppositely conjoined to each other

at a joint, and the silencing board is fixed at the joint.

In a more detailed aspect of the invention, a silencer for a vacuum cleaner comprises at least one hermetic expansion chamber mounted in an exhaust channel of the vacuum cleaner. The expansion chamber at its two sides has an inlet and an outlet connected to the exhaust channel. The cross-sectional area of the expansion chamber in the direction perpendicular to the airflow of is larger than that of each of the inlet and the outlet. A silencing board is mounted in the expansion chamber, separating the inlet from the outlet, with a plurality of pores distributed throughout in the silencing board. The expansion chamber is formed by two halves that are oppositely conjoined to each other at a joint, and the silencing board is fixed at the joint, The distances from two inner end faces of the expansion chamber, which contain the inlet and the outlet respectively, to the silencing board are both longer than 10 mm and shorter than 100 mm. The cross-sectional area of the expansion chamber in the direction perpendicular to the airflow is larger than double of that outlet. A noise-absorbing material is attached to inner walls of the expansion chamber, and the thickness of the noise-absorbing material is larger than 2 mm. A plurality of apertures are drilled around the circumference of each of the inlet and the outlet. The cross-sectional areas of the inlet and the outlet in the direction perpendicular to the airflow are both less than 5000 mm².

The invention provides the following advantages:

1. The silencer of the invention incorporates several different silencing structures and diminishes the noise generated by the vacuum cleaner in operation via its multi-silencing structure, thereby considerably improving the effect of noise reduction.
2. Several silencers of the invention can be connected in series, which will obtain a much better noise silencing effect.
3. The expansion chamber of the invention can be directly connected to the exhaust channel without the silencing board. The expansion chamber can also be mounted with the silencing board. The expansion chamber mounted with the silencing board can obtain a better effect of noise reduction.

Brief Description of the Drawings

Fig. 1 is a sectional view schematically illustrating a silencer for a vacuum cleaner

according to a preferred embodiment of the invention, wherein:

the numeral 1 denotes an expansion chamber, 2 denotes an inlet, 3 denotes an outlet, 4 denotes a silencing board, 5 denotes pores, 6 denotes a noise-absorbing material, and 7 denotes apertures.

Detailed Description of the Preferred Embodiment

The present invention is described below with reference to the preferred embodiment of the invention shown in Fig. 1.

As shown in Fig. 1, a silencer for a vacuum cleaner comprises at least one hermetic expansion chamber 1 mounted in an exhaust channel of the vacuum cleaner. The expansion chamber 1 at its two sides has an inlet 2 and an outlet 3 connected to the exhaust channel. The cross-sectional area of the expansion chamber 1 in the direction perpendicular to the airflow is larger than that of each of the inlet 2 and the outlet 3. A silencing board 4 is mounted in the expansion chamber 1 for separating the inlet 2 from the outlet 3, and a plurality of pores 5 are distributed throughout in the silencing board 4. The expansion chamber 1 is formed by two halves that are oppositely conjoined to each other at a joint, and the silencing board 4 can be mounted at the joint. The distances from two inner end faces of the expansion chamber 1, which contain the inlet 2 and the outlet 3 respectively, to the silencing board 4 are both longer than 10 mm and shorter than 100 mm. The cross-sectional area of the expansion chamber 1 in the direction perpendicular to the airflow is larger than double of that of the outlet 3. A noise-absorbing material is attached to inner walls of the expansion chamber 1, and the thickness of the noise-absorbing material is larger than 2 mm. A plurality of apertures 7 are drilled around the circumference of each of the inlet 2 and the outlet 3. The cross-sectional areas of the inlet 2 and the outlet 3 in the direction perpendicular to the airflow are both less than 5000 mm².

In operation, the airflow discharged from the vacuum cleaner first flows into the front half of the expansion chamber 1 through the inlet 2. The sudden enlargement of the cross section results in the effect of noise reducing. Meanwhile, the noise-absorbing material 6 attached to the inner walls of the expansion chamber 1 also absorbs an amount of sound energy, which can also reduce the noise. Then, the airflow passes

through the silencing board 4 which is densely distributed with pores 5, and the sound energy is further diminished. Thereafter, the airflow and the sound waves enter the rear half of the expansion chamber 1, and the reduced noise is still further diminished. If there is enough room, several expansion chambers 1 can be connected in series, which will further improve the noise silencing effect. The expansion chamber 1 of the invention can be directly connected to the exhaust channel of the vacuum cleaner. The expansion chamber 1 can also be mounted with the silencing board 4. The expansion chamber 1 with the silencing board 4 can obtain a better effect of noise reduction.

Claims

1. A silencer for a vacuum cleaner, which comprises at least one hermetic expansion chamber (1) mounted in an exhaust channel of the vacuum cleaner, the expansion chamber (1) at its two sides having an inlet and an outlet connected to the exhaust channel, and the cross-sectional area of the expansion chamber (1) in the direction perpendicular to the airflow is larger than that of each of the inlet (2) and the outlet (3).
2. A silencer for a vacuum cleaner according to Claim 1 wherein a silencing board (4) is mounted in the expansion chamber (1), separating the inlet (2) from the outlet (3), with a plurality of pores (5) distributed throughout in the silencing board (4).
3. A silencer for a vacuum cleaner according to Claims 1 or 2 wherein the expansion chamber (1) is formed by two halves that are oppositely conjoined to each other at a joint, and the silencing board is fixed at the joint.
4. A silencer for a vacuum cleaner according to Claims 1 or 2 wherein the distances from two inner end faces of the expansion chamber (1), which contain the inlet (2) and the outlet (3) respectively, to the silencing board (4) are both longer than 10 mm and shorter than 100 mm.
5. A silencer for a vacuum cleaner according to Claim 1 wherein the cross-sectional area of the expansion chamber (1) in the direction perpendicular to the airflow is larger than double of that of the outlet (3).
6. A silencer for a vacuum cleaner according to Claim 1 wherein a noise-absorbing material is attached to inner walls of the expansion chamber (1).
7. A silencer for a vacuum cleaner according to Claim 1 wherein a plurality of apertures (7) are drilled around the circumference of each of the inlet (2) and the outlet (3).
8. A silencer for a vacuum cleaner according to Claim 1 wherein the cross-sectional areas of the inlet (2) and the outlet (3) in the direction perpendicular to the airflow are both less than 5000 mm².
9. A silencer for a vacuum cleaner according to Claim 6 wherein the thickness of

the noise-absorbing material attached to the inner walls of the expansion chamber (1) is larger than 2 mm.

Abstract

This invention provides a silencer for a vacuum cleaner. The silencer for the vacuum cleaner comprises at least one hermetic expansion chamber mounted in an exhaust channel of the vacuum cleaner and allowing an exhaust airflow from the vacuum cleaner to pass through. The expansion chamber at its two sides has an inlet and an outlet connected to the exhaust channel. A silencing board is mounted in the expansion chamber, separating the inlet from the outlet. Pores are distributed throughout in the silencing board. The silencer integrates several different silencing structures together, and, when mounted to the exhaust port of the vacuum cleaner, can considerably diminish the noise generated by the vacuum cleaner in operation.

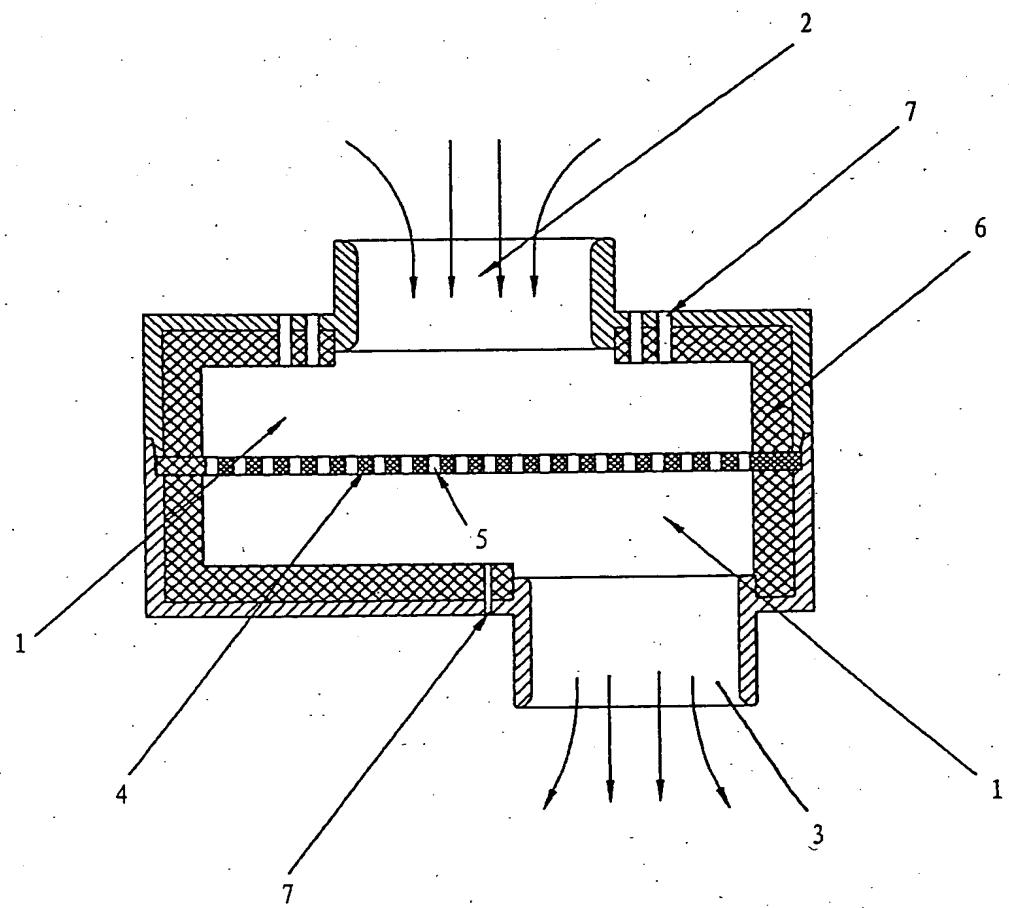


Fig. 1